Preparing Data in ArcGIS for CAD Integration

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I DON'T Do CAD
So why am I here?

- 90% Percent of my project work at some point will involve CAD Data.
- I do work with CAD data in the GIS Environment.
- I convert GIS to CAD and vise versa.

GIS

Geographic Information Systems

A Computer-Based System for Collecting, Viewing, Analyzing, Storing, Sharing, and Transforming Spatial Data

Examples of Uses

Architecture: Site Assessment, Urban Design, community planning

Water Resources: Dams, H&H Modeling, Levees

Natural Resources: Wetland/Watershed Delineations, Habitat Identification

Roadway: Corridor Studies, Environmental, ROW

Transportation Planning/Traffic: Travel Demand Modeling

Planning: Site Assessments

Water: Permitting & Environmental

Power: Transmission & Wind

Waste: Transfer Station Siting

Data - Available

LiDAR
Contours
Building Footprints
DEM
Hydrology
Parcels
Census Data
Wetlands
Wells
Schools
Places
Soils
Imagery
Dams
Political Boundaries
Airports
Bridges
Land Use/ Land Cover
Transportation Layers
Wildlife Habitat Areas
Utility Data
PLSS
Floodplain
Parks

Goals

- Preparing Vector Based Data
  - Points, Lines, Polygons, Annotation
- Preparing LiDAR

  Point Clouds, Classifications, Surfaces, Models
- Preparing Raster Based Data

  Imagery, DEMs, Other Rasters

Vector Based Data - Terms

- **Shapefile**
  - "[ESRI software] A vector data storage format for storing the location, shape, and attributes of geographic features. A shapefile is stored in a set of related files and contains one feature class." Esri

Vector Based Data - Terms

- Feature Class
  - "[ESRI software] In ArcGIS, a collection of geographic features with the same geometry type (such as point, line, or polygon), the same attributes, and the same spatial reference. Feature classes can be stored in geodatabases, shapefiles, coverages, or other data formats. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named "roads." In a geodatabase, feature classes can also store annotation and dimensions." Esri

Vector Based Data - Terms

- Geodatabase
  - 1.[ESRI software] A database or file structure used primarily to store, query, and manipulate spatial data. Geodatabases store geometry, a spatial reference system, attributes, and behavioral rules for data. Various types of geographic datasets can be collected within a geodatabase, including feature classes, attribute tables, raster datasets, network datasets, topologies, and many others. Geodatabases can be stored in IBM DB2, IBM Informix, Oracle, Microsoft Access, Microsoft SQL Server, and PostgreSQL relational database management systems, or in a system of files, such as a file geodatabase.

Vector Based Data Types

- Feature Dataset
  - "1.[ESRI software] In ArcGIS, a collection of feature classes stored together that share the same spatial reference; that is, they share a coordinate system, and their features fall within a common geographic area. Feature classes with different geometry types may be stored in a feature dataset." Esri

Vector Based Data – Recap

- Shapefile
  - A stand alone point / line / polygon geometry file.
- Feature Class – A point / line / polygon geometry type housed in a geodatabase.
- Geodatabase – A database storing spatially related point / line / polygon geometery.
- Feature Dataset – A collection of data with the same coordiante system stored within a Geodatabase.
  - Can also store raster formats.

Coordinate System

- First things first know your Coordinate System
  - GIS works in defined coordinate systems.
- "[coordinate systems] A reference framework consisting of a set of points, lines, and/or surfaces, and a set of rules, used to define the positions of points in space in either two or three dimensions." Esri

Coordinate System

- What Coordinate System and units of measure is the end user working in?
- Many GIS datasets including vector and raster types have a native coordinate system in meters.

Working Map Units

- Seed File
  - "A seed file is a CAD drawing that is used in its native format as an input parameter with the Export To CAD tool. It functions as a template and provides base data for the destination CAD file." Esri
  - Microstation V8 requires a seed file
  - AutoCAD is optional

Prepping Vector Data
DEMO

- Open ArcMap and set you coordinate system
- Add files you wish to convert to CAD
- Create a Geodatabase (.gdb / GDB) in ArcCatalog
- Create a Feature Dataset within your GDB.
- Set your view extent to the area of interest.

Prepping Vector Data
DEMO

- Right click the feature dataset with the GDB and select Import Multiple Feature
- Drag and Drop features from ArcMap into the tool.
- Select to the Environments tab and go to processing extent – set the processing extent to Same as Display.
- Run Tool!

Prepping Vector Data
DEMO

- In Microstation the level will be the name of the GIS feature. To override the level name create a filed called Layer (text 255)
- Annotation – Set the scale you want the annotation to be drawn at. Select which attribute to label and set placement properties.
- Right click the feature in ArcMap and lablel.

Prepping Vector Data
DEMO

- Once labeled – right click feature and choose to convert labels to annotation – choose in a database. Run Tool
- Repeat steps for other features in needed.
- Right click on feature dataset in GDB, choose export to CAD
- Select Microstation V8 and output location. Make sure add .dgn to end of name.

Prepping Vector Data DEMO

- For Microstation a seed file is required. Populate seed file option box by navigating to and selecting a Microstation seed file. Use a 2D for 2D features and 3D for 3D features.
- Run tool!

Prepping LiDAR Data DEMO

- LiDAR – Light detection and ranging
- LAS - native file format.
- LAS Files – Know your classes
  - Use ArcGIS to view and gain information about raw LiDAR Data
- Create LAS Dataset for quick and easy viewing.
  - Identify the average point spacing

Prepping LiDAR Data
DEMO

- LiDAR standard codes v1.0, 1.1 or 1.2:

Classification Value	Meaning
0	Created, never classified
1	Unclassified
2	Ground
3	Low Vegetation
4	Medium Vegetation
5	High Vegetation
6	Building
7	Low Points (noise)
8	Model Key-Points (mass points)
9	Water
10	Reserved for ASPRS Definition
11	Reserved for ASPRS Definition
12	Overlap Points
13-31	Reserved fro ASPRS Definition

Prepping LiDAR Data
DEMO

- Create a GDB and a feature dataset, same as before with vector data.
- LAS to multipoint – tool
- Add LAS file or files.
- Set output location
- Add Class code
- Select Returns

Prepping LiDAR Data DEMO

- Assign a projection
  - You will need to know the native projection to re-project the data. Check Metadata or provider for this information.
- Set Z factor to 3.28084 to convert from meters to feet.
- Run tool!
- Now you have created a multipart feature!

Prepping LiDAR Data DEMO

- Convert feature to ASCII text file.
- Use “Feature Class Z to ASCII tool
- Set parameters
- Run tool!

Prepping LiDAR Data DEMO

- Have a large order? Try a model
- Model Builder
  - "[ESRI software] The interface used to build and edit geoprocessing models in ArcGIS."
  - Standardize workflow
  - Helps reduce repetitive tasks
  - Good for QC - see how files were created.
- Set Parameters, Variables, Iterate
- Results in a custom tool!

Raster Data – DEM DEMO

- DEM – "[data models] Acronym for *digital elevation model*. The representation of continuous elevation values over a topographic surface by a regular array of z-values, referenced to a common datum. " Esri

Raster Data – DEM DEMO

- Similar to processing the vector data
- Set you data frame to the preferred output coordinate system.
- Set you view extents to the area of interest
- Export Data

Raster Data – DEM DEMO

- Right click DEM and choosed export.
  - Set both the extent and spatial reference to the data frame.
- Change Elevation units
  - Use the Raster Calculator tool.
  - Multiply raster by 3.28084

Raster Data – DEM DEMO

- Create 3D Contours
- Choose “Contour” Tool
- Set output and choose interval
- It's not 3D yet!
  - Check shape attribute for “z”
  - Choose “Feature to 3D by Attribute”
  - Set field to contour
- Export to CAD
  - Make sure to use a 3D seed file for MStation

Raster Data – DEM DEMO

- LiDAR unavailable?
- Create Grid Elevations from a DEM
  - 10M DEM should be available for the entire U.S.
  - Many regions now have 3M DEM
- Make sure to use the processed DEM
- Choose the “Raster to Multipoint” tool
- Then “Feature Class Z to ASCII”

Raster Data – Imagery DEMO

- Need a quick image for a project?
- Want to reference a USGS Topo?
- Possibly another image based web service?
- Add Image or Service to MXD
- Set your data frame to the preferred output coordinate system
- Zoom into area of interest

Raster Data – Imagery DEMO

- Set your scale
- Choose file > Export Map
  - Export to geo-tiff or Jpeg
  - Set DPI
    - The higher the DPI the better the resolution, but larger the file size
    - Jpeg files will be smaller than tiff files.
  - Create world file

FINISHED

Thanks for Attending!

Questions?